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# Institutional complexity is complexity with an adjective

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A review of the studies on institutional complexity reveals that the many definitions of institutional complexity and related concepts share similarities with the understanding of complexity and complex systems of complexity science. Yet few publications on institutional complexity engage explicitly with complexity science. Most observers still confuse complicated and complex systems, for instance. Furthermore, the variety of definitions may create disarray regarding what institutional complexity and its related concepts are and what they imply. Highlighting the similarities between institutional complexity and complexity science in global governance, this think piece offers a conceptual and operational definition of institutional complexity using a complexity science lens. It highlights the attributes and properties of institutional complexity. It also presents the benefits of such an approach. Besides offering advantages in terms of concept clarification, this approach aims to engage theoretically, epistemologically, and methodologically with the complexity of global governance, as well as propose a way to answer remaining questions on this crucial topic.

**Keywords**: institutional complexity; International Relations; complexity science; conceptualisation

## Many definitions of institutional complexity without much complexity

An increasingly acknowledged property of global governance is its institutional complexity, visible in the increasing number and diversity of international institutions overlapping in addressing a given issue area of global governance (Abbott, Green & Keohane, 2016; Zelli, Möller, & van Asselt, 2017). Studying institutional complexity is key to both our understanding of the functioning of global governance and our managing of the issues addressed through global governance. Accordingly, scholars have looked at this phenomenon directly and indirectly through diverse perspectives and concepts. They have offered a plethora of definitions of institutional complexity and related concepts. These generous efforts have been fruitful, but they have also generated disarray as to what institutional complexity actually is. Seeking to make sense of them, I perceive three analytical dimensions widely used in the study of institutional complexity, i.e. fragmentation, polycentricity, and the emergence of novelty.[1]

First, fragmentation has been a prominent issue in the literature on institutional complexity. It generally refers to the coexistence of different clusters of institutions working towards cooperation in global governance (Kim, 2019). The image of global governance architecture, which describes the all-encompassing system of institutions (whether public or private) working on a specific issue area in world politics (Biermann, Pattberg, van Asselt, & Zelli, 2009), is deeply linked to the concept of fragmentation. It emphasises the presence of distinct substructures, which may appear at distinct levels, comprising the wider system. Similarly, albeit related specifically to the climate governance subfield, hybrid multilateralism describes the increasing interactions of state and non-state actors in global cooperation on climate issues (Bäckstrand, Kuyper, Linnér, & Lövbrand, 2017). Doing so, this concept draws attention to actors and relationships the International Relations literature has traditionally ignored. These

[1] Other scholars have paid attention to slightly different analytical dimensions of institutional complexity. Zürn and Faude (2013), for instance, add to the analysis of fragmentation the concepts of differentiation and coordination. More recently, Kim (2019) identifies three main concepts in the discussion on institutional complexity, i.e. fragmentation, polycentricity, and complexity. Building on this effort, I choose to look at the emergence of novelty rather than complexity, considering that the former captures a more specific process than the latter, which, as I show later on, is involved in all aspects of institutional complexity.

characterisations of global governance, or global climate governance, seek to show how entities interact and overlap constantly, increasing the complexity of the system. An important concern in this line of work lies in the conflicts to which institutional complexity may lead, generally understood as institutional overlaps (Hofmann, 2011). Institutional complexity publications specifically emphasise the diversity of international institutions focusing on an issue area and overlapping in their work (Zelli et al., 2017). Fragmentation often leads to conflicts and overlaps, yet it might also lead to synergies, interplay, cooperation, and connectivity (Gómez-Mera, Morin, & Van de Graaf, 2020; Kim, 2019).

Several scholars have studied these synergies through the analytical dimension of polycentricity. Often used in environmental studies, polycentricity can be understood as a situation in which there is no central authority, but multiple interacting entities at distinct levels which adjust and self-organise (Galaz, Crona, Österblom, Olsson & Folke, 2012; Morrison, Adger, Brown, Lemos, Huitema, & Hughes, 2017). Using a polycentricity perspective helps scholars insist on the benefits of a decentralised approach to global governance (Kim, 2019). Building more on complexity-related concepts, some witness the emergence of a variety of regimes complexes, defined as "nested, partially overlapping, and parallel international regimes that are not hierarchically ordered" (Alter & Meunier, 2009, p. 13; see also Gehring & Faude, 2013; Keohane & Victor, 2011; Orsini, Morin, & Young, 2013). As interacting systems regulating distinct issue-areas (Gómez-Mera et al., 2020), regime complexes underline both the fragmentation and polycentricity of global governance. Similarly, studies on institutional complexes describe these as "complex interaction situations in which two or more international institutions interact to cogovern issue areas in international relations (Raustiala & Victor, 2004) and form interlocking structures (Underdal & Young, 2004, p. 374-375) of global governance" (Oberthür & Stokke, 2011). Also looking at substructures of global governance, Bernstein and Hoffmann (2019) identify a global carbon lock-in based on the existence of interdependent systems locked into fossil energy use. All these studies generally pay attention to the sturdiness of institutional structures in global governance.

The third analytical dimension I identify in the literature on institutional complexity is the emergence of novelty. The interactions of multiple institutions, which imply synergy or conflict and may cause blockage, sometimes lead to the rise of new institutions or regimes (Gómez-Mera et al., 2020). Regime complexes or institutional complexes generate order in global governance, which appears as a new property thereof (Gehring & Faude, 2013, 2014). Interactions might also facilitate the emergence of new norms which might enable a governance breakthrough (Klijn & Koppenjan, 2014).[2] Other evolutions of norms include processes of norm cascade or institutionalisation (Kelley, 2008; Margulis, 2013). Norm changes are often slow, but periods of punctuated equilibrium sometimes occur which enable rapid change (Galaz, Tallberg, Boin, Ituarte-Lima, Hey, Olsson, & Westley, 2017). One reason why novelties emerge is the diversity of parties involved in a regime complex treaty (Hollway, Morin, & Pauwelyn, 2020). Another reason might be the emergence of exploration processes through which negotiators go in order to develop new norms (Morin, Pauwelyn, & Hollway, 2017). Altogether, the three dimensions presented uncover prominent aspects of the institutional complexity of global governance. Paying attention to interactions and their effects gives a clearer picture of the complex functioning of institutions in global governance.

Nevertheless, the multiplicity of concepts related to institutional complexity and definitions thereof also reveals a lack of consensus and possible confusion as to what institutional complexity actually is. Numerous and diverse perspectives help give a wider understanding of a phenomenon and consider more aspects thereof. Yet, they also make it harder for scholars to understand each other, discuss and answer specific questions collectively.

[2] While Klijn and Koppenjan's publication focuses on public policy, its general observations apply to the institutional complexity of global governance as well.

Resorting to complexity science might prove useful to deal with this problem. Indeed, while the literature on institutional complexity highlights important aspects of complexity, it does so mostly without explicitly making use of the complexity science literature. Complexity science represents a diverse body of literature seeking "to understand the coexistence of order and disorder and the constant dynamic transformations from one to the other." (Morçöl, 2012, p. 7) It studies many diverse natural and social complex systems, such as human brains, ant colonies, national or global economies or politics. Because of its interest in both natural and social systems, it is relevant to analyse the institutional complexity of global governance. Using a complexity science lens might help clarify the definition and implications of institutional complexity in the global governance context. It might mitigate issues of lack of consensus or coherence noted by several scholars (Gómez-Mera et al., 2020; Kim, 2019). It might also help answer some remaining questions in this line of work related to the adaptation of systems of institutions (Kim, 2019). In certain fields, such as the governance of climate change, where uncertainty forces us to adjust governance at the same time as knowledge evolves, understanding how systems of institutions adapt is crucial.

Taking stock of the past studies of institutional complexity, this think piece seeks to offer a conceptual and operational definition of institutional complexity building on complexity science and recent publications in International Relations. The remainder of the piece is organised as follows. After underlining the similar arguments yet distinct vocabularies of global governance understandings of institutional complexity and complexity science definitions of complexity, I introduce one way to clarify the concept of institutional complexity using a complexity science lens. I then offer a conceptual and operational definition of institutional complexity through the lens of complexity science. Building on former studies of complex systems in International Relations, this definition includes a description of the attributes and properties of institutional complexity. To conclude, I stress the benefits of using a complexity science approach to analyse institutional complexity.

## Between institutional complexity and complexity in complexity science

The characteristics and properties of institutional complexity mostly parallel those of complex systems presented by the wide complexity science literature, including the few International Relations studies that have used complexity science to analyse international phenomena. Yet, the institutional complexity literature has not truly engaged with complexity science. In addition to often using a different vocabulary, it has tended to ignore some core tenets of complexity highlighted by complexity science, such as nonlinearity or the emergence of new properties. 'Precising' (Collier & Levitsky, 1997; Sartori, 1984) the concept of institutional complexity through a complexity science lens appears relevant. It could lead to several benefits, including differentiating institutional complexity from other notions and clarifying the meaning of related concepts, avoiding concept-stretching, and helping answer remaining questions in the literature.

### *How complexity is understood in complexity science*

In order to highlight the similarities between institutional complexity and complexity in complexity science, it is necessary to provide more insights on complexity and complex systems from complexity science. The variety of concepts and definitions thereof in the institutional complexity literature echoes that of complexity and complex systems in the complexity science literature. Defining complexity is tricky, if not impossible (Cilliers, 1998). Several authors indeed see complexity as DEEEP (i.e. Difficult to Explain, Evolve, Engineer or Predict) (Page, 2015, quoted Pattberg & Widerberg, in Orsini, Le Prestre, Haas, Brosig, Pattberg, Widerberg, Gómez-Mera, Morin, Harrison, Geyer, & Chandler, 2019). It

encompasses many ideas that scholars include or not in their arguments (Orsini et al. , 2019). As Bousquet and Curtis put it, "Complexity is best thought of as the array of concepts, methods and intuitions that emerged piecemeal from an engagement with specific non-linear, adaptive, emergent and/or self-organizing phenomena/problems that revealed the limitations of existing scientific approaches." (2011, pp. 1-2)

Several authors have managed to provide descriptions of the defining characteristics of complex systems. Orsini and Le Prestre highlight three features of complex systems, i.e. the interconnectedness of multiple diverse actors, operating at different levels, in an open system (in Orsini et al., 2019). Others stress the non-linearity, emergence, self-organisation, and openness of complex systems (Bousquet & Curtis, 2011; Pattberg & Widerberg, in Orsini et al., 2019). Young also insists on telecoupling, or the idea that the driver of a change is far removed from its effects in space or functions (2017, p. 93). Telecoupling, nonlinearity, and the rise of emergent properties all lead to increased uncertainty. Mitchell more broadly defines complex systems as "system[s] in which large networks of components with no central control and simple rules of operation give rise to complex collective behavior[s], sophisticated information processing, and adaptation via learning or evolution" (2009, p. 13).

For Le Prestre (2017), it is crucial to distinguish between the attributes of complex systems and their properties, what constitutes them and what they produce, their causes and their consequences. Doing so makes it easier to "[ask] questions regarding which characteristics of the system lead to what kind of properties" (2017, p. 135). Orsini and Le Prestre (in Orsini et al., 2019) identify three properties of complex systems, i.e. self-organisation, emergence, and adaptation. Self-organisation reveals the lack of central authority in complex systems (Mitchell, 2009). Emergence is a crucial property, which some scholars of complexity science often consider to be as the core of complex systems (Orsini & Le Prestre, in Orsini et al., 2019; Teisman & Gerrits, 2014). Holland (1992) sees parallelism, competition, recombination as the three mechanisms enabling the adaptation of systems. Others see variety, diversity, and variations as factors of adaptability (Boulton, Allen, & Bowman, 2015).

*Similarities between the institutional complexity literature and complexity science*

Drawing from the literature on institutional complexity and complexity science, Table 1 identifies the most important elements of institutional complexity and complexity and complex systems.[3] It shows that, in many cases, the two sets of literature refer to similar ideas, although they use distinct concepts.[4] They usually note that the global governance system has become more crowded with institutions (Alter & Meunier, 2009; Raustiala & Victor, 2004). They agree that institutional density, or a large number of entities in a system, does not make a system complex (Cilliers, 1998), yet they do argue that global governance has become more complex (Gómez-Mera, 2017). They perceive several common elements as accounting for complexity.

[3] The analytical dimensions regarding the literature on institutional complexity do not apply to the literature on complexity science.
[4] Some exceptions include Morin and collaborators (2017), Kim (2019), Gehring and Faude (2014) and Alter and Meunier (2009). The latter notably link international regime complexity and complex systems.

| Institutional complexity literature | | Complexity science |
|---|---|---|
| Fragmentation | Numerous and diverse institutions (Bäckstrand et al., 2017; Biermann et al., 2009; Gómez-Mera, 2017; Zelli et al., 2017) | Numerous and diverse entities (Cilliers, 1998; Le Prestre, 2017; Mitchell, 2009) |
| | Institutional overlap, interplay or interdependence (Biermann et al., 2009; Gehring & Faude, 2013; Hofmann, 2011; Zelli et al., 2017) | Interconnections of entities (Boulton et al., 2015; Le Prestre, 2017; Miller & Page, 2007) |
| Polycentricity | Porous boundaries of regime complexes, regime shifting (Gómez-Mera et al., 2020; Orsini et al., 2013) | Openness (Boulton et al., 2015; Le Prestre, 2017; Cilliers, 1998) |
| | Involvement of distinct levels, multilevel governance (Bäckstrand et al., 2017; Biermann et al., 2009; Kim, 2019; Morrison et al., 2017; Raustiala & Victor, 2004) | Hierarchy (Le Prestre, 2017) |
| | Adjustments of entities in a polycentric system (Galaz et al., 2012; Kim, 2019; Morrison et al., 2017) | Adaptation (Holland, 1992; Le Prestre, 2017; Mitchell, 2009) |
| | Order (Gehring & Faude, 2013), niche selection or competition (Gómez-Mera et al., 2020 ; Stokke, in Oberthür & Stokke, 2011) | Self-organisation (Boulton et al., 2015; Le Prestre, 2017) |
| Novelty emergence | New properties and norms in global governance, norm institutionalisation (Hollway et al., 2020; Kelley, 2008; Margulis, 2013; Morin et al., 2017; Gehring & Faude, 2013) | Emergence (Boulton et al., 2015; Miller & Page, 2007; Mitchell, 2009; Morçöl, 2012; Teisman & Gerrits, 2014) |
| | Punctuated equilibrium and rapid changes, norm cascade (Galaz et al., 2017; Kelley, 2008) | Nonlinearity (Cilliers, 1998; Miller & Page, 2007; Young, 2017) and unpredictability (Le Prestre, 2017) |

*Table 1 Important elements identified in the institutional complexity literature and complexity science*

Regarding attributes, both approaches first highlight a high number of diverse entities. Second, they are interested in the interactions (direct or indirect) of those entities. This is visible in their focus on interplay, overlap, interlinkages, or interconnectedness among the institutions or entities studied. More specifically, the two approaches consider the high degree of interactions among institutions as a crucial element of complexity. These interactions make institutions prone to becoming interdependent, which increases the level of complexity. Besides, both sets of theories witness the entanglement of distinct levels of action, although the institutional complexity literature visibly engages less with the multiplicity of hierarchical levels. Furthermore, there seems to be some porosity or flexibility in the borders of institutional complexes or regimes. They exchange information with their environments, which participate in shaping them. As Orsini and collaborators describe, "Perceptions draw the boundaries of the complex, indicating which regimes are recognized—or not—as elements of a complex." (2013: 31) This echoes the openness of complex systems, which interact with their environment (Le Prestre, 2017).

Regarding properties, a few scholars explicitly discuss the self-organisation and presence of emergent properties in institutional complexes, although they are often those who already use a complexity

science lens (Gehring & Faude, 2013, 2014). Others more implicitly indicate the presence of self-organisation processes by looking at more specific phenomena. For instance, processes of niche selection or competition among institutions of regime or institutional complexes highlight the need for institutions to revise their mission to survive in a crowded system (Gómez-Mera et al., 2020; Stokke, in Oberthür & Stokke, 2011). Similarly, some researchers indirectly point to the adaptability of these complexes by looking more into how entities of a complex might adjust their goals to international concerns or changes (Galaz et al., 2012; Kim, 2019).

By and large, these similarities reveal that, on many occasions, scholars working on institutional complexity use concepts that are close to those of complexity science, while not referring directly to it. Building on this observation, I argue that we could make the definition of institutional complexity more precise and gain in clarity by using a complexity science lens and the vocabulary thereof.

## "Precising" the definition of institutional complexity

### *What 'concept precising' is about*

Referring explicitly to complexity science when discussing institutional complexity is relevant and could help make the concept more precise. Ultimately, this could bring several benefits to the study of the phenomenon institutional complexity represents.

To build a complexity science definition of institutional complexity, I draw from several political science publications that stress the importance of concept formation (Collier & Levitsky, 1997; Gerring, 1999; Goertz, 2005; Sartori, 1970). According to Goertz, "Concepts are theories about ontology: they are theories about the fundamental constitutive elements of a phenomenon" (2005, p. 5). When specifying the concept of institutional complexity, one builds a theory about the phenomenon to which it refers and, more generally speaking, about global governance. Furthermore, Sartori insists on the idea that one cannot measure the extent of a phenomenon before defining the concept to which it refers: "concepts are not only elements of a theoretical system, but equally tools for fact-gathering, data-containers." (1970, p. 1052) Concepts are thus also important for empirical testing. Sartori also argues that we need to accept the trade-off between avoiding conceptual stretching (or "vague, amorphous conceptualizations," at p. 1034) by making our concepts more abstract, and enabling differentiation among similar, yet distinct ideas. For Collier and Levitsky (1997) however, a trade-off is not always necessary. Other strategies for concept innovation, such as determining the sub-types of a concept, "precising" the concept, or shifting to the overarching notion of which it is part, can prevent this trade-off.

I envision the use of a complexity science lens as a way of "precising" the concept of institutional complexity. Making the concept of institutional complexity more precise by adding defining criteria might help differentiate similar phenomena, such as institutional density or complicated institutional systems (which are still reducible, while complex ones are not). It might also facilitate the identification of mechanisms inherent to adaptation processes, such as parallelism or recombination. Doing so, concept "precising" also avoids conceptual stretching by preventing scholars from using the concept of institutional complexity when looking at any institutionally crowded issue-area. The goal of this operation is also to make explicit some criteria that are implicitly understood as part of the definition of institutional complexity, yet not expressed as such (Collier & Levitsky, 1997).

Below, I specify the concept of institutional complexity by enumerating its attributes and properties and highlighting some possible indicators as a way of operationalising the definition and making institutional complexity ultimately more easily observable and measurable. I build on Orsini and

Le Prestre's efforts to define complex systems in International Relations.[5] I apply their division of attributes and properties of complex systems to institutional complexity and add indicators for each element, which help operationalise the definition of institutional complexity. Thus, Figure 1 illustrates the conceptual and operational definition of institutional complexity highlighting its attributes and properties. On the left of the institutional complexity case appear the attributes (or causes), while on the right appear the properties (or consequences). The far left and far right cases are possible indicators of the different variables presented.

*The attributes and properties of institutional complexity*

I see institutional complexity as a dimension of global governance. As such, it bears the attributes of complex systems underlined by Orsini and Le Prestre as open systems of multiple interconnected entities of diverse types that have nonlinear interactions and operate at various levels (in Orsini et al., 2019). It also has the same properties, i.e. self-organisation, emergence, and adaptability. Thus, I define institutional complexity as *the multiplicity and diversity of interconnected international and transnational institutions (operating at distinct levels or in diverse sectors, interacting, or overlapping in their work on a specific issue area), in the open system of global governance; altogether, these institutions are likely to self-organise, have emerging systemic properties, and adapt to their environment.*

Institutional complexity has several defining attributes which one can observe using diverse indicators. The multiple institutions operating in the system are present in different sectors and levels, thus mixing public, private, local, national, regional, and international entities. This is particularly visible in the global climate governance arena, in which the mix of actors of different types and levels of action has been increasingly prominent, leading some to talk about a transnational climate regime complex (Abbott, 2012).

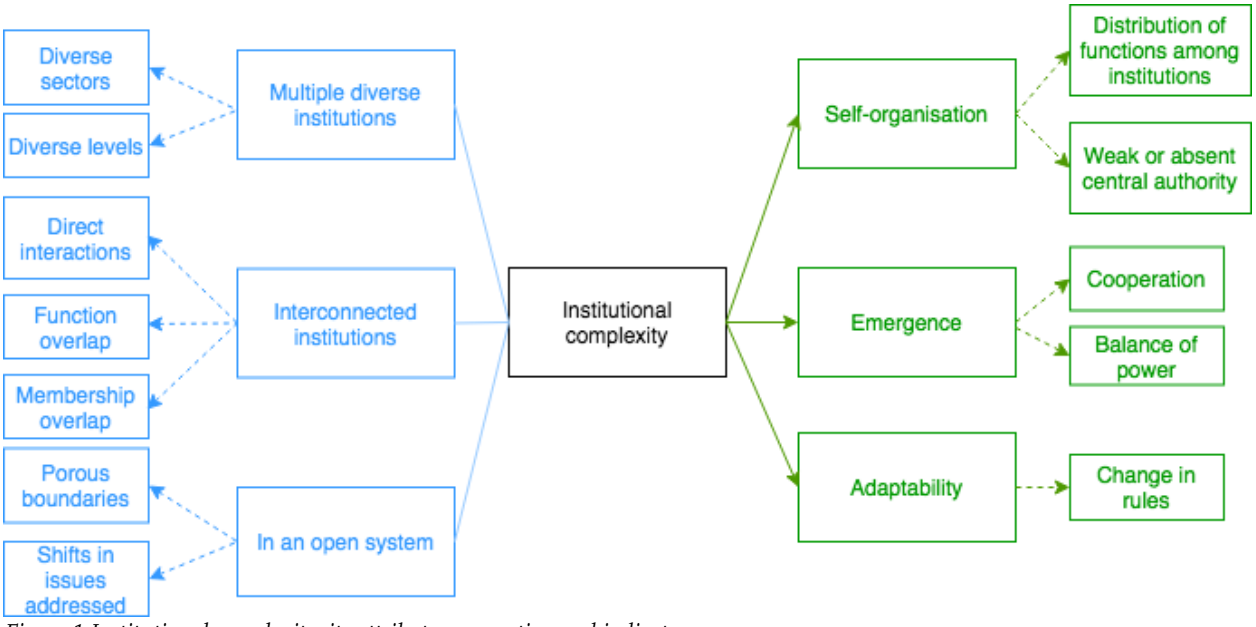

*Figure 1 Institutional complexity, its attributes, properties, and indicators*

[5] I consider Orsini and collaborators' forum an International Relations' import from complexity science rather than a publication belonging to the institutional complexity literature.

The second attribute of institutional complexity lies in the interconnectedness of institutions. Units of complex systems have different types of interactions. They might interact directly through collaboration, coordination, or competition, for instance (e.g. in the climate regime, the United Nations Framework Convention on Climate Change, and the Convention of Biological Diversity, see Zelli, Gupta, & van Asselt, 2013). Another type of interaction might consist of one institution creating another institution (e.g. in the trade regime, the MERCOSUR and the Framework Treaty on the Environment of the MERCOSUR). Institutions might also interact indirectly. For instance, institutions that overlap interact indirectly, because they focus on the same issue-areas (e.g. the Forest Carbon Partnership Facility, the Forest Investment Programme, and the UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation, see Zelli et al., 2017), or include many members in common (e.g. World Trade Organization, and the Montreal Protocol). The interactions of the entities of global governance understood as a complex system might be nonlinear: the interconnectedness of entities and the openness of the system make it likely that some interactions might have an unexpectedly strong influence on others, and vice-versa. Nonlinearity may also be combined with telecoupling.

The last attribute of institutional complexity is openness, which is the capacity of complex systems to interact with their environment (Orsini & Le Prestre, in Orsini et al., 2019). It appears slightly harder to observe than the other attributes mentioned above in the literature on institutional complexity. Yet, the case of the plant genetic resources regime complex shows, over time, an increase in the number of institutions involved in the regime complex, and the boundaries of the elemental regimes appearing progressively blurred (Raustiala & Victor, 2004). The boundaries of regime complexes might also appear porous. Frequent interactions with the environment might cause them to change. Issue shifts are possible. For instance, in the global health governance complex system, the interactions of health, economic, and development agendas have led to a paradigm shift (Hill, 2010). Perceptions of internal and external actors can influence these boundaries. Alter and Meunier elaborate on this idea through the notion of regime shifting: "In regime-shifting, actors may use forum-shopping, strategic inconsistency, or other strategies with the ultimate goal of redefining the larger political context so as to ultimately reshape the system of rules itself" (2009, p. 17).

Institutional complexity also has several properties, which one can understand as consequences of its attributes, or causes. Self-organisation lies in the absence of a clear authority and the order of the system through the effects of the system itself and its interactions (Orsini & Le Prestre, in Orsini et al., 2019). For Cilliers, it is "a process whereby a system can develop a complex structure from fairly unstructured beginnings" (1998, p. 12). Self-organisation stems from the interplay and overlap of institutions, which lead the system to organise by creating, for instance, division of labour among the distinct institutions. There can still be overlap, but many institutions tend to differentiate themselves from others at least in some aspects. Abbott's transnational climate change governance triangle illustrates both functional differentiation and overlap (2012, p. 575). Types of transnational climate actors vary (i.e. actors belong to state, civil society organisation, or firm actor groups, and might be state-led, collaborative, or private-led). These diverse types match diverse functions (i.e. standards and commitments, operational, information and networking, and financing). A variety of similar actors have the same function, which shows functional overlap. No central authority appears to be coordinating the distribution of functions. Despite some efforts to orchestrate the global climate governance subsystem, the UNFCCC has failed to play that part. Its support to the actions of the elements of the subsystem have surely had a role to play in the development of the climate regime complex, yet many transnational initiatives have developed outside of this framework.

Another property of institutional complexity is the possibility of new systemic properties emerging. Emergence is the notion of unexpected systemic outcomes, which arise from the interactions of the system's entities (Orsini & Le Prestre, in Orsini et al., 2019). Put differently, "Emergence is a

phenomenon whereby well-formulated aggregate behavior arises from localized, individual behavior" (Miller & Page, 2007, p. 46). For instance, envisioning the Earth as a natural complex system, its climate may be seen as an emergent property (Kim & Mackey, 2014). Here again, the literature on institutional complexity provides few explicit examples of emerging properties. A valuable indicator to observe emergence in global governance is cooperation. For instance, the global governance field of trafficking in persons has grown from almost nothing in twenty years. Since the 2000 UN Protocol to Prevent, Suppress, and Punish Trafficking in Persons, especially Women and Children, cooperation has evolved to make it an important transnational regime complex (Gómez-Mera, 2017). Another indicator to which one should pay attention is balance of power in the institutions of global governance. After the Cold War, the global governance system experienced the rise of a unipolar configuration as an emerging property influencing international outcomes. This unipolar configuration has led, for instance, to the reinforcement of financial institutions demanding open markets and free trade (Finnemore, 2009). These elements illustrate emerging properties of institutional complexity.

Finally, the last property of institutional complexity is adaptability. Adaptability can be understood as "the potential capacity of units to learn from and coevolve with their environment" (Orsini & Le Prestre, in Orsini et al., 2019). Units adapt to changes in their environment, which helps the system adapt. Adaptability is visible in the systemic responses to the environment through changes in the rules, creation, and disappearance of institutions. For instance, international environmental law has adapted to new circumstances through decisions based on the evolution of science and knowledge taken in conferences of the parties (Kim & Mackey, 2014). The rules of the Convention on International Trade in Endangered Species of Wild Fauna and Flora thus regularly evolve regarding targeted endangered species in light of new information on their status.

The last two properties, i.e. emergence and adaptability, as well as the openness attribute appear to be understudied in the literature on institutional complexity. Gehring and Faude (2013) mention the question of emergence in regime complexes but they do not elaborate. Likewise, some studies of polycentricity indirectly bring up the question of adaptation through the notion of adjustment (Morrison et al., 2017). Kim (2019) also refers to it as an issue that needs to be further investigated. The example of international environmental law above thus draws from the International Relations complexity science literature. More empirical analysis is necessary to emphasise the presence of these elements in global governance institutional settings.

Overall, a variety of examples show the relevance of using a complexity science perspective to study institutional complexity. Yet, as pertinent as 'precising' the definition of institutional complexity might appear, discussing the benefits of such an enterprise is crucial.

**What are the benefits of this approach?**

The study of institutional complexity has so far helped go beyond the consideration of the increasing number of international and transnational institutions and pay attention to several aspects of complexity. In that sense, it represents a step forward in the acknowledgement of the growing complexity of global governance and its consequences. Yet, it is important to engage more with a variety of challenges linked to complexity. 'Precising' the definition of institutional complexity using complexity science could help us do so.

First, there are benefits related to conceptual formation itself. As argued by Gerring (1999), concept formation not only offers more clarity, but it is also an attempt to respond to the following demands: familiarity, resonance, parsimony, coherence, differentiation, depth, theoretical utility, and field utility. For Sartori (1970), concept formation allows for better conscious empirical research. Concepts, after all, are data containers.

Second, using a complexity science lens to study institutional complexity is important for theoretical, epistemological, and methodological reasons. The reductionist tradition seeking to decompose systems into individual parts has been prominent in International Relations. Yet, this Newtonian and mechanistic thinking has revealed its limits in the study of global governance. While complexity theories remain marginal in International Relations (notwithstanding Kavalski's 2007 claim of the emergence of a fifth debate), the discipline could benefit from their integration. Indeed, they offer theories of change it may lack. Regime theory, for instance, has favoured a static view of regimes (Hoffmann, 2006). However, a complexity approach might help better account for its dynamic dimension and facilitate the production of new theories explaining the vivid and unpredicted changes of global governance over the last decades.

Regarding epistemological implications, instead of trying to beat unpredictability, scholars should accept it and agree to step away from the recurring and related goals of explaining and predicting. A complexity science lens offers new ways to describe and understand global governance. Scholars should pay particular attention to the benefits of description. Instead of trying to predict the unpredictable, complexity science might help us generate plausible scenarios of what might happen in a certain context (van der Ven, Bernstein, & Hoffmann, 2017). This could help us establish strategies and policy interventions for better anticipation, an optimal goal for social sciences. Complexity approaches might not be the only way to study complex problems, yet they surely are a valuable one.

Regarding methodology, defining institutional complexity through the lens of complexity science may foster the use of appropriate, yet still understudied methods that focus, for instance, on causal complexity and interconnections. A wide range of methods might help further investigate the complexity of global governance, including network analysis, system dynamics modelling, or scenario building.

Finally, and most importantly, the use of a complexity lens in the study of institutional complexity could help us answer remaining questions such as that of the adaptation of systems of institutions in a changing environment. This piece has mentioned several issue-areas in which institutional complexity is prominent, among which climate change. Considering the uncertainty regarding the future of the Earth's climate and the constant need to adapt the measures taken and the governance instruments implemented to new scientific discoveries and political demands, understanding how not only climate governance institutions but also and most importantly their system may adapt is crucial. The adaptation of complex systems has been the subject of many studies in complexity science (Holland, 1992; Miller & Page, 2007; Young, 2017). These studies have analysed mechanisms such as variation, parallelism, or recombination which the institutional complexity literature has not tackled, although doing so might provide answers to its own questionings. Several elements of the complexity science toolkit are likely to help us answer this question and others with which, as scholars of institutional complexity, we still struggle.

Overall, this think piece has tried to specify the definition of institutional complexity using principles of complexity science. Depending on the subsystem considered, global governance may display more or less institutional complexity. Therefore, when scholars talk about institutional complexity, going beyond the number and diversity of institutions at play in global governance may prove useful. In other words, one may see institutional complexity as complexity with an adjective. In that context, it is crucial to examine some fundamental principles of complex systems that apply to this concept, especially those that have been overlooked by institutional research so far (e.g. adaptability). This think piece is just a preliminary attempt at agenda-setting that needs further applications and refinements. Hopefully it will achieve its goal of encouraging students of institutional complexity to engage more with complexity and see its opportunities rather than be held up by its challenges.

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